



Docket No. 55567

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: C. Willkens

SERIAL NO.: -09/828,484- / 01090, 468

EXAMINER: J. Jeffrey

FILED: March 4, 2002

GROUP: 3742

FOR: CERAMIC IGNITERS

Commissioner For Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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Group 3700

DECLARATION UNDER 37 CFR 1.132

I, Taehwan Yu declare as follows:

1. I received a Ph.D. in Materials Science and Engineering from the Massachusetts Institute of Technology in 1996. From the year 2000 to the present, I have been employed by the Saint-Gobain Corporation, and I have conducted research in the areas of the design and development of ceramic igniters throughout that employment. My present job title is Senior Research Engineer.

2. I am familiar with the above-identified application.

3. I conducted the following experimental work. A series of 24 volt sintered igniter elements having differing hot zone (resistive zone) lengths were evaluated to assess the effect of hot zone electrical path length relative to speed (i.e. time to specified ignition temperature after applying electrical input to the igniter) and temperature. These tested sintered igniters corresponded to the igniter disclosed in Example 1 of the above-identified application and were of the same composition and general dimensions, but had differing hot zone lengths as specified below.

4. More specifically, a series of sintered igniter elements corresponding to the igniter of Example 1 of the above-identified application and having differing resistive zone electrical path lengths were measured for their speed and resistance at 20.4V and temperature and amperage at temperature and amperage at 20.4V, 24V and 26V. Average values of measurements on the tested igniter elements from each tile are reported in Table 1 below. Speed was measured by time to temperature (TTT) to 1050°C at 20.4V. TTT of more than 10 seconds and temperatures of less than 800°C are reported as N/A as it exceeded the measurement capabilities. Figures 1 and 2 set forth below show the average electrical path length in hot zone relative to average speed (@20.4V) and temperature (@24V) for each tested igniter. TTT of 10 seconds and temperature of 0°C were assigned in the below Figures to the igniters exceeding the limit of measurement capabilities. Overall, there is a correlation of longer electrical path length with slower TTT and cooler temperature at the tip of the igniter element. Longer electrical path length increases the room temperature resistance and thus lowers in-rush current that is needed for rapid heating to ignition temperature. Additionally, longer electrical path length increased the overall volume of the resistive hot zone further inhibiting rapid heating.

20.4V				24 V		26.4 V		Electrical path length
Temp °C	Amps (A)	TTT to 1050C (sec)	RTR (ohms)	Temp	Amps	Temp	Amps	(cm)
N/A	0.34	N/A	33.44	N/A	0.35	N/A	0.35	3.81
N/A	0.35	N/A	33.26	N/A	0.35	N/A	0.36	3.65
N/A	0.42	N/A	24.47	N/A	0.43	N/A	0.44	2.74
N/A	0.40	N/A	26.07	N/A	0.41	N/A	0.43	2.64
815	0.68	N/A	11.48	979	0.72	1062	0.76	1.16
776	0.64	N/A	13.49	951	0.68	1036	0.72	1.26
1135	1.07	4.25	6.07	1272	1.18	1346	1.28	0.45
1144	1.09	4.11	5.78	1283	1.20	1359	1.30	0.40
1216	1.31	2.41	5.74	1320	1.43	1383	1.55	0.35
1258	1.64	1.95	3.15	1349	1.79	1421	1.93	0.23
1268	1.63	1.85	3.26	1358	1.78	1435	1.91	0.15

Table 1. Average measured value of TTT (time to temperature to 1050°C) and RTR (room temperature resistance) at 20.4V and temperature and amperage at 20.4V, 24V and 26V for various electrical path lengths.

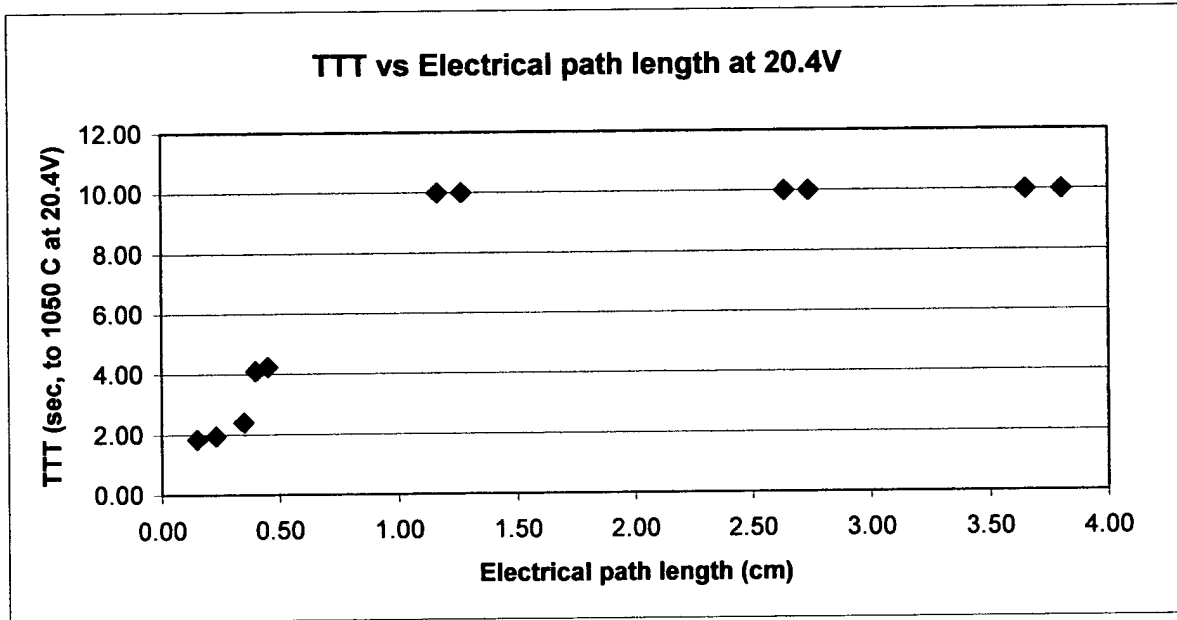


Figure 1. TTT vs. Electrical path length at 20.4V. Igniter elements with TTT of more than 10 seconds were assigned to 10 seconds in the figure.

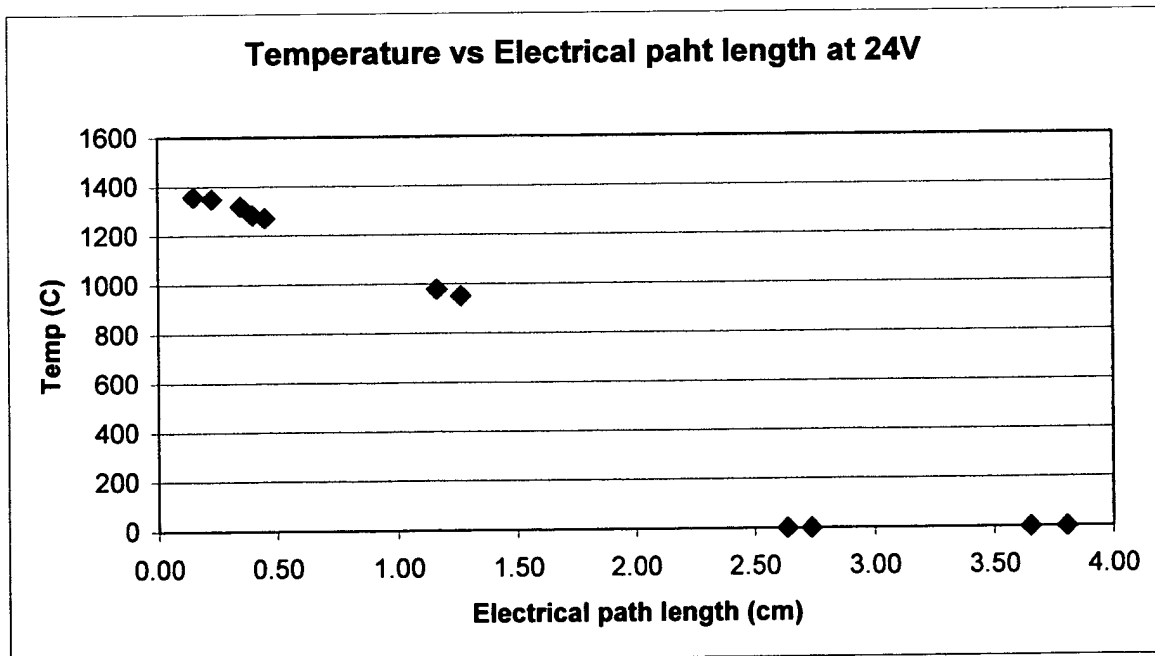
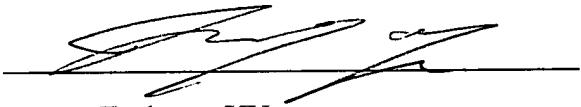


Figure 2. Temperature vs. Electrical path length at 24V. Elements with temperature of less than 800°C were assigned to 0°C in the figure.

5. The above results show that speed (i.e. time to targeted ignition temperature) decreases and temperature is reduced with increases in electrical path length of resistive hot zones of otherwise comparable igniter elements that have booster zone regions.

6. I hereby further declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Date: 1-30-2008


Taehwan YU